CLAIMS

1 - Active barrier (1) for waters polluted by material lighter than the water and immiscible with it, used to contain and to collect a floating polluting material (5) which floats on a mass of water, said active barrier (1) being supported by two supporting units (2) and comprising a plurality of interconnected containment modules (3) in such a way that the resulting length of the active barrier (1) is enough to surround said floating polluting material (5), said active barrier (1) being **characterised in that:**

- said containment modules (3) are provided with a pumping means able to pump out said floating polluting material (5); and

- each of said supporting units (2) are provided with traction and treatment assemblages (4), which are each connected to the two ends of the active barrier (1), said traction and treatment assemblages (4) serving to provide traction to said pumping means, and to collect and to treat said floating polluting material (5).

2 - Active barrier (1), according to claim 1, **characterised in that** each containment module (3) comprises:

- at least two floats (31), installed vertically one over the other, substantially rigid and preferably tubular in shape, which serve to give the active barrier (1) the ability to float;

- a skirt (32), rigidly connected to the underpart of the float (31), which is made in a flexible and high strength material, able to resist traction, said skirt (32) having the same length as the float (31), said skirt (32) serving to hinder floating polluting material to pass under the active barrier (1), said skirt (32) being provided with a ballast (321) at its undermost part, which serves to keep the active barrier (1) stable and tensioned;

- two collecting tubes (33), having the same length as the floats (31), substantially flexible, each of them located alongside each sides of the floats

(31), said collecting tubes (33) serving to collect and to transport to a location the collected mixture of water and floating polluting material, to clean up the mass of water from said floating polluting material;

- male and female relatively flexible quick connection joints (34), each of them located at opposite ends of each collecting tube (33) of the active barrier (1), said connection joints (34) allowing the collecting tube (33) to be male to female interlinked, and therefore the containment modules (3), thereby forming the active barrier (1).

3 - Active barrier (1), according to claim 2, **characterised in that** the structural components of the containment modules (3) of the active barrier (1) being interconnected by means of external connecting means.

4 - Active barrier (1), according to claim 3, **characterised in that** said external connecting means preferably comprise pipe brackets (35).

5 - Active barrier (1), according to claim 2, **characterised in that** the ends of said tubular floats (31) are blocked in order to confine air into them.

6 - Active barrier (1), according to claim 2, **characterised in that** said floats (31) are stuffed with a hydrophobic material.

7 - Active barrier (1), according to claim 2, **characterised in that** said floats (31) are integrally made in a material having a density less than 1,0.

8 - Active barrier (1), according to claim 2, **characterised in that** said ballast (321) of the skirt (32) is made in a heavy material, but able to freely move to any direction, said ballast (321) having the same length as the skirt (32), and being provided at its ends with a quick connecting system (3211), which allow said ballast (321) of said skirt (32) to be connected to a similar ballast (321) existing in a skirt (32) of an adjacent containment module (3).

9 - Active barrier (1), according to claim 8, **characterised in that** said heavy material preferably comprises a chain.

10 - Active barrier (1), according to claim 2, **characterised in that** said collecting tubes (33) are provided with a plurality of openings (331), equally spaced apart along the entire length of each collecting tube (33), said openings (331) being located in the face of the collecting tubes (33) opposite to the floats (31), facing the mass of floating polluting material (5), in order to allow water and floating polluting material (5) to enter into the collecting tubes (33).

11 - Active barrier (1), according to claim 10, **characterised in that** said openings (331) are circular in shape.

12 - Active barrier (1), according to claim 10, **characterised in that** said openings (331) are sloped oblong in shape.

13 - Active barrier (1), according to claim 10, **characterised in that** said openings (331) are elliptical in shape.

14 - Active barrier (1), according to claim 10, **characterised in that** said openings (331) have the shape of a integral "S".

15 - Active barrier (1), according to claim 2, **characterised in that** a pumping train (41) comprising a plurality of impeller modules (411) which displace into the collecting tubes (33).

16 - Active barrier (1), according to claim 15, **characterised in that** the displacement of the pumping train (41) into the collecting tube (33) causes a suction effect, due to the differential pressure derived from such displacement, which causes a mixture of water and floating polluting material to be sucked into the collecting tube (33), through the openings (331), the collected fluids being then carried to the supporting unit (2) by the pumping effect caused by the displacement of the pumping train (41).

17 - Active barrier (1), according to claim 16, **characterised in that** each impeller module (411) existing into each collecting tube (33) of each

containment module (3) of the active barrier (1) has the same length as the collecting tube (33), said impeller module (411) comprising a plurality of impeller cups (4111) equally spaced apart and fixed to a segment of cable (4112), the latter being provided in each of its ends with a quick connector (4113), which enables the impeller module (411) to be connected to a impeller module (411) of another containment module (3).

18 - Active barrier (1), according to claim 17, **characterised in that** each containment module (3) is provided with two impeller modules (411), which displace in opposite directions into each collecting tube (33).

19 - Active barrier (1), according to claim 17, **characterised in that** each impeller module (411) is in the shape of impeller bristles (4114) which project radially from a segment of cable (4115).

20 - Active barrier (1), according to claim 1, **characterised in that** the traction and treatment assemblage (4) comprises:

- a tank (42), comprising a first hermetic compartment (421), a second hermetic compartment (422) and a third hermetic compartment (423), said first, second and third hermetic compartments (421; 422; 423) serving to collect and to theat the collected water and floating polluting material (5);

- two connecting tubes (43), rigidly connected at a first end to the tank (42), which are curved in such a way that the second end can be set at the ocean level, said second level being connected to a collecting tube (33) of a containment module (3) of the active barrier (1), said connecting tubes (43) serving to ultimately carry the mixture of water and floating polluting material (5) collected in the active barrier (1) to the tank (42);

- two vertical double pulleys (44), both located into the tank (42), a first one located at the first hermetic compartment (421), and a second one located at the third hermetic compartment (423), the first pulley (44) serving to guide the pumping train (41) arising from one of the connecting tubes (43) towards said first, second and third hermetic compartments (421; 422;

423), and te second pulley (44) serving to guide the pumping train (41) when it leaves the tank (42) towards the other of the connecting tubes (43) connected to the active barrier (1);

- two horizontal guiding tubes (45), located immediately after the last pulley (44), serving to guide the pumping train (41) in the interior of the tank (42);

- a traction device (46), horizontally located at the upper part of the tank (42), driven by a source of power, said traction device (46) causing the pumping train (41) to displace into the collecting tubes (33) of the containment modules (3) which form the active barrier (1).

21 - Active barrier (1), according to claim 20, **characterised in that** said pumping train (41) coming from one of the collecting tubes (33) of a containment module (3) at one end of the active barrier (1) enters into one of the connecting tubes (43), is guided by one of the pulleys (44) into the first hermetic compartment (421), and reaches one of the guiding tubes (45), which guides said pumping train (41) to the traction device (46), which exert traction in the pumping train (41), said pumping train (41) is then guided to the other of the guiding tubes (45), passes by the second one of the double pulleys (44) located at the interior of the third hermetic compartment (423), enters into the other of the connecting tubes (43), and is finally introduced into the other of the collecting tubes (33) of the same containment module (3) of the active barrier (1) previously mentioned.

22 - Active barrier (1), according to claim 20, **characterised in that** said traction device (46) is horizontally located into the tank (42) and connected to a source of power.

23 - Active barrier (1), according to claim 20, **characterised in that** said traction device (46) comprises a cylindrical body (461) connected to a central shaft (462) by spokes (463), said cylindrical body (461) being additionally provided with traction cradles (464), fixed to some of the

spokes (463), said traction cradles (464) serving to receive into them and to urge to move forward an impeller cup (4111) of the impeller module (411).

24 - Active barrier (1), according to claim 23, **characterised in that** the number of traction cradles (464) fixed to spokes (463) depends on the spacing of the impeller cups (4111) along the pumping train (41).

25 - Active barrier (1), according to claim 24, **characterised in that** it is used three traction cradles (464) angularly distributed in the edge of the cylindrical body (461) of the traction device (46).

26 - Active barrier (1), according to claim 20, **characterised in that** said first hermetic compartment (421) is used to collect the mixture of water and floating polluting material collected in the active barrier (1) and to wash the impeller cups (4111), by immersion in solvents.

27 - Active barrier (1), according to claim 20, **characterised in that** said second hermetic compartment (422) is used to receive and to treat the mixture of water, polluting material and solvent which come from the first hermetic compartment (421).

28 - Active barrier (1), according to claim 20, **characterised in that** said impeller cups (4111) are rinsed into the third hermetic compartment (423), by means of jets of fluid, before the impeller cups (4111) come back to the active barrier (1).

29 - A Method to deploy an active barrier (1) as described in the previous claims **characterised in that** it comprises the following steps:

a - position the two supporting units (2) near the floating polluting material (5) to be confined;

b - connect two impeller modules (411) of a first containment module (3) of the active barrier (1) to two impeller modules (411) located into a traction and treatment assemblage (4) located at one of the two supporting units (2), the connection being made by quick connectors (4113);

c - connect the collecting tubes (33) of said first containment module (3) of the active barrier (1) to the ends of the connecting tubes (43) of the traction and treatment assemblages (4), by means of the connection joints (34);

d - connect two impeller modules (411) of a second containment module (3) of the active barrier (1) to the ends of two impeller modules (411) of the first containment module (3) of the active barrier (1);

e - connect the end of the ballast (321) of the skirt (32) of the second containment module (3) of the active barrier (1) to the end of the ballast (321) of the skirt (32) of the first containment module (3) of the active barrier (1), by means of the connecting system (3211);

f - connect the collecting tube (33) of the second containment module (3) of the active barrier (1) to the end of the collecting tube (33) of the first containment module (3) of the active barrier (1), by means of the connection joints (34);

g - repeat the above steps "d", "e" and "f" until the length of the active barrier (1) is enough to surround the floating polluting material (5);

h - connect the two impeller modules (411) of the last containment module (3) of the active barrier (1) to the two impeller modules (411) existing into the traction and treatment assemblages (4) of the second supporting unit (2), by means of the quick connector (4113);

i - connect the collecting tubes (33) of the last containment module (3) of the active barrier (1) to the ends of the connecting tubes (43) of the traction and treatment assemblages (4), by means of the connection joints (34);

j - drive the pumping train (41) by means of each traction device (46) existing in each of the two supporting unit (2), at the same time.